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San Juan, Puerto Rico, January, 1931.

THE HAND REFRACTOMETER FOR PREHARVEST ANALYSIS OF SUGARCANE.

By R. L. Davis, Agronomist.

The hand refractometer has been adopted in Hawaii for making field analyses of sugarcane prior to harvest. The hand refractometer gives the total solids in the cane juice, and this reading, in turn, approximates the sucrose content. The purity cannot be determined by the hand refractometer, but experiments conducted at the Hawaii Sugar Planters' Experiment Station, however, show a constant relation between the sucrose and purity of a given variety of cane. If the sucrose content is high, the purity is also, and vice versa. These Hawaiian experiments also showed that the readings of the hand refractometer were quite dependable for preharvest sampling, closely approximating the hand-mill analyses.

The hand refractometer consists of a short telescope with a glass prism at one end and an eyepiece covered with red glass at the other. The glass prism is enclosed in a hexagonal chamber with a hinged cover. It is furnished in a leather case with a shoulder strap, and, barely exceeding a pound in weight, it is easy to transport.

To operate the refractometer the prism chamber is thrown open, and a few drops of cane juice placed on the black inner ground glass surface of the cover. The instrument is closed, and readings taken looking thru the red glass. The scale on the eyepiece of the telescope gives the readings direct. Correction for temperature may be made by use of a thermometer, but this may not be necessary if the readings are always taken at about the same time of day.

The Hawaiian method of collecting the sample is as follows:- A small section is taken from a central joint of each of 20 to 25 canes chosen at random in different parts of the field. Pliers are used to squeeze the juice from these sections. The juice is mixed, and a few drops placed on the ground glass of the refractometer. The refractometer is then closed, and, looking towards the sunlight, the observation is taken at the boundary line between the dark and light portions of the scale.

At Mayaguez it has been found convenient to collect the sample by means of an ice pick and tissue paper. The ice pick is thrust thru the center of the canes and worked up and down to force out the juice, which is absorbed by the tissue paper. Juice from the centers of 5 or 6 canes is collected on the tissue paper and then squeezed out onto the ground glass. A fresh piece of tissue paper is used for each sample. Four or five readings are taken of samples collected in this way in different parts of the field and the results are averaged to approximate the sucrose for the whole field.

Preliminary trials made on a Mayaguez field of P. O. J. 2725 gave the following readings. Samples were collected from 20 to 25 canes.

Hand refractometer
January 15, 1930
Percentage of
total solids

14.0

15.9

16.6

16.6

15.6

Average... 15.74

The hand-mill analysis made from the same stools one month later gave a sucrose of 16.71 per cent., which, allowing for the longer ripening period, is approximately the same result as the readings secured with the hand refractometer.

Hand-refractometer readings were also taken at Mayaguez on 50 stools of first-year seedlings. The data were sorted according to the percentage of total solids found. The averages for the refractometer readings, as given in the following table, correspond closely with hand-mill analyses made on the same stools one month later; those seedlings that gave a hand-refractometer reading of over 16, with very few exceptions also gave a hand-mill analysis equaling or exceeding this figure.

Number of stools sampled	Total number of canes	Hand refractometer		Hand-mill analyses
		Jan. 15, 1930		Feb. 15, 1930
		Range of readings Percentage of total solids	Average reading Percentage of total solids	Percentage of sucrose
11	55	12 to 13.9	13.38	15.30
14	70	14 to 14.9	14.47	15.66
13	65	15 to 15.9	15.36	16.58
5	25	16 to 16.9	16.61	17.04
7	35	17 and above	17.80	17.02

The hand refractometer is not an expensive piece of equipment and should prove especially useful to sugar centrals having scattered plantings from which it is difficult to handle and ship large, long cane samples to the main office for hand-mill analysis.

The following information was obtained from the records of the Department of the Interior, Bureau of Land Management, for the year ending December 31, 1900.

State	Section	Acres	Value
Alabama	1	100	100
Alabama	2	100	100
Alabama	3	100	100
Alabama	4	100	100
Alabama	5	100	100
Alabama	6	100	100
Alabama	7	100	100
Alabama	8	100	100
Alabama	9	100	100
Alabama	10	100	100
Alabama	11	100	100
Alabama	12	100	100
Alabama	13	100	100
Alabama	14	100	100
Alabama	15	100	100
Alabama	16	100	100
Alabama	17	100	100
Alabama	18	100	100
Alabama	19	100	100
Alabama	20	100	100
Alabama	21	100	100
Alabama	22	100	100
Alabama	23	100	100
Alabama	24	100	100
Alabama	25	100	100
Alabama	26	100	100
Alabama	27	100	100
Alabama	28	100	100
Alabama	29	100	100
Alabama	30	100	100
Alabama	31	100	100
Alabama	32	100	100
Alabama	33	100	100
Alabama	34	100	100
Alabama	35	100	100
Alabama	36	100	100
Alabama	37	100	100
Alabama	38	100	100
Alabama	39	100	100
Alabama	40	100	100
Alabama	41	100	100
Alabama	42	100	100
Alabama	43	100	100
Alabama	44	100	100
Alabama	45	100	100
Alabama	46	100	100
Alabama	47	100	100
Alabama	48	100	100
Alabama	49	100	100
Alabama	50	100	100
Alabama	51	100	100
Alabama	52	100	100
Alabama	53	100	100
Alabama	54	100	100
Alabama	55	100	100
Alabama	56	100	100
Alabama	57	100	100
Alabama	58	100	100
Alabama	59	100	100
Alabama	60	100	100
Alabama	61	100	100
Alabama	62	100	100
Alabama	63	100	100
Alabama	64	100	100
Alabama	65	100	100
Alabama	66	100	100
Alabama	67	100	100
Alabama	68	100	100
Alabama	69	100	100
Alabama	70	100	100
Alabama	71	100	100
Alabama	72	100	100
Alabama	73	100	100
Alabama	74	100	100
Alabama	75	100	100
Alabama	76	100	100
Alabama	77	100	100
Alabama	78	100	100
Alabama	79	100	100
Alabama	80	100	100
Alabama	81	100	100
Alabama	82	100	100
Alabama	83	100	100
Alabama	84	100	100
Alabama	85	100	100
Alabama	86	100	100
Alabama	87	100	100
Alabama	88	100	100
Alabama	89	100	100
Alabama	90	100	100
Alabama	91	100	100
Alabama	92	100	100
Alabama	93	100	100
Alabama	94	100	100
Alabama	95	100	100
Alabama	96	100	100
Alabama	97	100	100
Alabama	98	100	100
Alabama	99	100	100
Alabama	100	100	100

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